H1 Products from reactions

Learn about:
- Useful chemical reactions

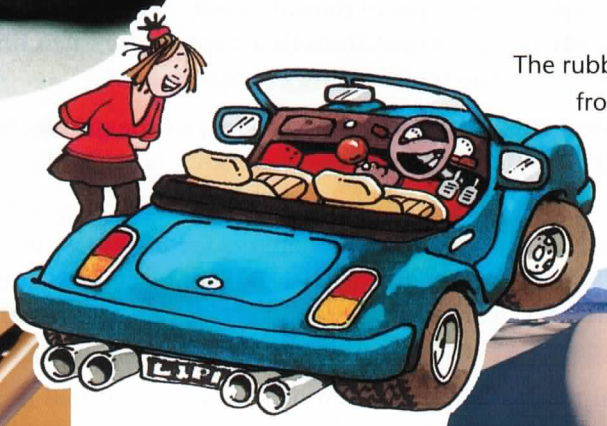
Some useful products

Some chemical reactions make useful products. Nearly everything we use has been made from **raw materials** changed by chemical reactions into something more useful. Think about the materials used in a car.

The steel body is a form of iron made from iron ore (iron oxide) by heating it with coke. The molten iron is then converted to steel by dissolving small amounts of carbon in it.

The aluminium in the engine is made from bauxite (aluminium oxide). Bauxite is heated until it melts and the aluminium is split from the compound using electricity.

The rubber for the tyres can be made from the sap of the rubber tree. The sticky sap reacts with sulphur to make it harder and springier.



The plastic for the dashboard is made from chemicals in oil. Crude oil is distilled to separate the chemicals in it. Some of these are then broken up and rearranged by chemical reactions to produce plastics such as polystyrene and PVC.

The glass for the windscreen is made from sand. Pure sand is cleaned with acid before being melted with other chemicals.

a **Draw a flow chart for the processes above, ending with the production of a car.**

The chemistry of food

When you cook food, chemical reactions take place. They break down the food chemicals to make it softer, or easier to digest. They also make it taste better. When you make toast, some of the starch in the bread is broken down into sugar, which makes toast taste sweet. But burnt toast is just carbon!

Proteins in food are also broken down by chemical reactions during digestion, to produce smaller molecules called amino acids. Other chemical reactions then produce new proteins such as those you need for muscle growth and repair.

When food goes bad, the chemical reactions are not so useful. Bacteria and fungi grow on the food, and their chemical reactions produce poisonous waste products. If you eat food that has 'gone off', these poisons can make you very ill.

But sometimes we can use fungi to make special food for us, by using the chemical reactions that take place inside fungi. Read this case study from Dr Vega.

I am a food scientist. I do quality control testing on food. Our raw materials are a microscopic fungus and cheap starch made from potatoes. The fungus feeds on the starch and grows really quickly. Its body is made up of highly nutritious protein. This fungal protein is called Quorn.

Quorn is a really cheap protein that can be used in many different foods. If you use the right chemical reactions, you can make it look and taste like chicken and other meats.

It was first made in the 1960s. Our company had to do tests on the fungi for years to be sure that they were safe to eat. I make sure that every batch of Quorn produced is of good quality.

b **Draw a flow chart to show how meat-free 'chicken nuggets' could be made from potatoes.**

The chemistry of life

All life relies on chemical reactions.

- Plants make the food they need using a chemical reaction. They use sunlight to combine carbon dioxide and water to make glucose. Oxygen is a waste product.
- All living things respire to get the energy they need for carrying out life processes. In respiration, glucose combines with the oxygen you breathe. Carbon dioxide and water are waste products. This chemical reaction gives out energy and is similar to burning a fuel (see page 76).
- Chemical reactions during digestion make glucose from starchy foods such as bread. The glucose is used for respiration.

c **You breathe in oxygen but breathe out carbon dioxide. Where does the carbon dioxide come from?**

Did you know?

Plants make food using the chemical reaction called photosynthesis (see page 22). Plants and animals get energy from food using the chemical reaction called respiration. Respiration is the opposite reaction to photosynthesis.

Questions

1. Copper is used for electrical wiring. The raw material for this is copper ore (copper oxide). Suggest a chemical reaction that could be used to get the copper from this ore.
2. When plants make their own food using sunlight, the chemical reaction is like respiration in reverse. Write a word equation for this reaction.
3. Yeast is a microorganism used in brewing and baking. It changes sugar into ethanol (alcohol) and carbon dioxide as it respires. This process is called fermentation.
   - **a** Write a word equation for fermentation.
   - **b** Which is the useful product in brewing?
   - **c** Which is the useful product in baking? Explain your answer.
4. Plants also need phosphorus to grow well. Ammonium phosphate is made by reacting ammonium hydroxide with phosphoric acid. Write a word equation for this reaction.

For your notes:

- Most materials around us are made by chemical reactions.
- Some chemical reactions are useful and some are not.